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ABSTRACT

A procedure for developing a costing model is described. Limitations of a cost analysis are also reviewed, with attention to the problems of handling joint products, obtaining accurate faculty effort data, measuring educational outputs, and calculating marginal costs. A researcher charged with developing a costing model is faced with the task of developing the methodology leading to the cost model. The researcher must also decide what type of analysis should be done and how the results should be displayed. The cost model should include the following seven steps: determining how the decision-makers intend to use the cost data, defining the costs to be considered, deciding how to measure the costs, determining the cost objectives, deciding how to assign costs to the cost objectives, deciding what analyses are to be performed upon the cost data, and determining the display formats. To aid the researcher, outlines are presented of the costing options, including: 15 uses of cost data; different types of costs (e.g., direct costs, marginal costs); ways to measure instruction and program costs, cost objectives, methods of assigning costs to cost objectives, and analysis options. (SW)

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BUILDING AN INSTITUTIONAL COSTING MODEL

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ABSTRACT

The purpose of this paper is to assist a researcher who is charged with the development of a costing model for his/her institution. The major contribution of the paper is a suggested procedure for accomplishing this task. The recommended procedure has been used by the author and a small team of researchers and has proven to be an effective approach. By using the procedure as the agenda for a series of meetings, a team can quickly reach agreement on the decisions needed to construct a formal cost model.

In order to refresh the reader's understanding of the limitations of any cost analysis, the paper also reviews the major problems of handling joint products, obtaining accurate faculty effort data, measuring educational outputs, and calculating marginal costs problems which remain to be solved.

BUILDING AN INSTITUTIONAL COSTING MODEL

Introduction

For well over fifty years, higher education costing and cost analysis have been an important issue about which much has been written. Interest in costing persisted during the growth years of the 1950s and 1960s as a technique for injecting a plausible rationality into the allocation of additional resources and as evidence of responsible stewardship of public funds. In recent years, the extreme fiscal pressures on higher education institutions has intensified the preoccupation with costs and created a greater interest in determining the cost of educational programs, activities, and units. In most cases the organizational complexity of institutions, the level of fiscal detail available, and the sophistication of costing techniques has elevated the task of costing to one that is manageable only by the use of a computer. The most effective use of a computer involves the development of a "model" which ties together an extensive series of calculations to produce a desired end product. Specifying the nature of the model to be built is a difficult task because of the hundreds of alternatives involved. The purpose of this paper is to provide a systematic approach that enables the participants to efficiently sort out the many options and make the appropriate choices.

When presented with a charge to build a costing model, a prudent first reaction is to consult the literature, not only to look for details on models built and reported on by others, but also to bring oneself abreast of current developments. The next section is intended to assist the reader in this first step.

The Literature

Because costing methods tend to be rather technical in nature, most of the writings on this issue have been intended for a rather small, specialized audience. As a result, the more useful literature tends to be in the form of commission reports, institutional studies, research reports, and unpublished papers. Since most of these writings were not meant for general circulation, learning of their existence is sometimes as much a matter of good luck as diligent research. In addition, it often happens that the supply of printed copies has long been exhausted leaving one with the frustration of being unable to find a copy of a much cited study.

For the current researcher who is limited in time by the press of events an excellent starting point is the 1978 four volume study commissioned by the American Council on Education entitled, "A Study of Cost Analysis in Higher Education." The ACE, supported by a Ford Foundation grant, selected four respected faculty members from the University of Minnesota Graduate School of Business Administration to carry out a "systematic investigation of concepts, procedures, uses, and outcomes of cost analysis in higher education." This study extended over a four year period. The first volume, "The Literature of Cost and Cost Analysis in Higher Education," performs the immensely valuable service of surveying the literature up to 1978, capturing not only the serialized journal articles but the many unpublished reports and papers that would have by now passed completely from view. With this as a starting point, a computer search of the ERIC data base from 1978 forward can be used to select relevant reports and articles.

Certainly, the one research institution that has become firmly linked with costing in everyone's mind is the National Center for Higher Education Management Systems (NCHEMS). Several of the most useful technical documents listed among the references (specifically [9], [12], [13]) were produced by this institution. Three other references, [1], [6], and [11], provide the reader with additional technical details and methodologies.

Aside from the key references [1], [6], [9], [11], [12], [13], which are oriented toward technical details, there is nothing unique about the reference list provided with this paper. The remaining documents listed are simply those that were found to be useful for gaining general background material. Most of the information found in these references could be found in other publications.

Considering the pragmatic nature of costing, one would expect to see within the literature many case studies relating the experiences, both successes and failures, of costing methodologies tried at different institutions. The scarcity of such case studies comes as a surprise. Is one to suppose that the failures--which are never pleasant to admit--far outnumber the successes? The few case studies reported are either related to very specialized organizations (medical) or to large state systems (California, New York, Indiana) and are therefore less interesting to university researchers wishing to develop an internal cost study.

A researcher embarking on a reading program with the expectation of finding a convenient categorization of various costing methodologies, each associated with a full discussion of strengths and weaknesses, is soon to be disappointed. No such categorization exists. In fact, there are no lists of identified methodologies and no pro and con type discussions of specific costing methods. The literature, in general, is quite informal and

fragmented; often the reports do not differentiate between the cost data needed for internal management as opposed to data needed for external reporting--two very dissimilar processes.

More than one author has noted the need for more reflection on the conceptual issues (what precision is needed, at what frequency should data be generated, etc.) and less preoccupation with mechanical issues such as definitions and standardization procedures. The next section, summarizes what has been written and repeatedly expressed throughout the literature with regard to several important issues. Since the technical details of costing and the limitations of cost analysis are inextricably bound to philosophical views and value judgments, one should spend some time reflecting on these issues before plunging onward with the more concrete and therefore more easily dealt with problems of technique and data manipulation.

Summary of Key Ideas Related to Institutional Costing in Higher Education

The Current Viewpoint

One does not have to read far into the costing literature before it becomes clear that the current viewpoint is one which considers every aspect of costing to be dependent upon the uses to which the final cost data is to be applied. Such an understanding was not always the accepted view. In fact, prior to 1960 the business accounting literature was dominated by an accounting approach which presumed that for any item produced there was a "unique cost." As a result, prior to 1960 the standard approach was to first lay down an accounting theory and then from it develop rules for the collection of costing data. Today the enlightened approach is one which abandons the view of "absolute truth (cost)" in favor of "conditional truth (cost)". Thus, like beauty, cost lies in the eye of the beholder. This new

viewpoint causes the emphasis to shift from a preoccupation with rigid accounting rules and definitions to a closer scrutiny of the needs of the decision maker and the nature of the problem for which (s)he seeks cost information. The modern perception is that costing is less a problem of measurement and more a problem of understanding the decision process; cost is not unique because cost assessment depends upon the decision maker's perspective, [1].

Costing Standards

Because the specifics of a costing model are dependent upon the problem to which the cost data is to be applied, the particular viewpoints of the decision makers, and the organizational idiosyncracies of the institution, there is no "standard" costing methodology--nor can there be. Less obvious is the fact that there are no "standard" costs associated with various educational activities. In order to establish benchmarks for educational costs it would be necessary to collect data in a systematic manner from nearly identical institutions. Such laboratory-like conditions do not prevail in higher education. Bowen [3] noted that very large variances have appeared in <u>every</u> comparative cost study among institutions. Such variances persist even when great care is taken to use similar institutions, adjust for geographical region, and exclude expenses for research and public service. His conclusion was that academic programs tend to be more dissimilar than we think--they certainly differ in terms of quality. Bowen also conjectured that the independence of educational institutions allows them the freedom to allocate funds how they wish--even to the extent of maintaining uneconomic functions. Researchers in the California higher education system [5] discovered that there are at least five points in the

data gathering process of any cost study where subjective decisions significantly alter the data.

These statements were operationally borne out when NCHEMS tried to carry out an exchange of cost data among six major research institutions [12, 13] under carefully controlled conditions. The consensus was that the subjective issues could not be eliminated by definitions and data manipulations and that the final cost figures could not be considered as representing benchmarks. Recognizing that the NCHEMS costing procedures are regarded as being the most highly refined procedures in existence--resulting from over a decade of intensive effort--it appears that the establishment of standard costs is yet an unsolved problem--at least for major research institutions. At first sight, this situation may not seem particularly discouraging to those researchers who propose to construct a costing methodology for internal use only. After all, why should the inability to compare costs among institutions be any concern for one who simply wants to "cost out" programs or units within the home institution. The concern does not surface until later; it occurs at the point when administrators begin to feel uncomfortable in rendering judgments on the efficiency of academic units without a frame of reference. When this concern becomes a request for the development of "comparable cost" data from other institutions, the researcher finds himself projected into the difficulties just described.

Marginal Costs

The development of marginal costing remains as one of the major unsolved problems in higher education costing. In spite of enormous improvements in data storing and processing capabilities in the last few decades, it seems we have made little progress toward developing even rudimentary

marginal costs. Certainly one reason for this lack of advancement is the fact that institutions were strongly motivated not to solve this problem. Until recent years, higher education was passing through a period of growth in which the public institutions were being supported according to their enrollment. Moreover, this public support was largely calculated by the use of average costs per student; since average costs exceed marginal costs to a significant degree, this meant that public appropriations exceeded institutional need and thereby encouraged the unconstrained expansion of institutions. While most alert administrators were fully cognizant of what was occurring, no one was motivated to point out the error in this method of appropriating funds; for many it was easy to rationalize that higher education was only making up ground lost during the lean years of the past. In reflection, this attitude is far less troubling than the fact that so few people could perceive the consequences of their silence or, in the case of those who did see future difficulties, preferred to ignore them in favor of short term gains. By now, nearly all public institutions have learned that an appropriation mechanism that overfunds universities during a growth period will underfund them when a decline in enrollment dictate a withdrawal of funds. Moreover, state legislators and budget officials have received too much encouragement on the use of average cost figures throughout the last decade for them to be easily re-educated.

Within an institution, however, marginal costs should be the issue of primary concern regardless of how appropriations are determined. An academic administrator--at any level--when faced with a need to reduce budgets must somehow determine how much money can be recovered if a given activity is scaled back in proportion to an enrollment decline. Such determinations must guide the decisions as to where to cut back and how much. The problem

is further complicated by the fact that what may appear to be a marginal cost that is linked to enrollments may in reality be a cost that is fixed by policies regarding tenure and affirmative action. Thus researchers must determine what portion of the "marginal cost" is truly recoverable. A trial and error procedure is obviously a crude way to approach this problem and yet this is often the only recourse.

For example, within an academic department the largest proportion of recoverable expense is represented in "extra" faculty. The difficulties begin once one begins to measure this recoverable cost by precisely defining what an "extra" faculty member is. The complexities of this problem mount with each constraint that must be observed. The magnitude of the problem is often only apparent when the investigator has taken into account the department's commitment to tenured faculty and affirmative action, the necessity for offering essential or required courses at appropriate frequency and regardless of enrollment, physical limitations on laboratory and classroom space, and the fact that faculty are not completely interchangeable even within a department. At this point it becomes clear that the marginal costing problem, if it is to be solved, will only be done at the unit level where all the relevant information is available. The solution will come when unit planners are given some motivation to measure their inessential resources and reveal their flexibility. The correct approach will not evolve from a particularly ingenious manipulation of data at the central administration level.

Faculty Activity Analysis

If, as it is frequently claimed, the sine qua non of realistic cost analysis is faculty activity analysis (FAA) then it is equally true that FAA

is the weakest link in the costing process. In recent years, the need to account for how faculty spend their time was given considerable impetus by federal accountability requirements placed on sponsored research projects. By now, the faculty in most universities have become resigned to the need for them to periodically indicate what proportion of their time is spent in each of several activities. However, administrators in the isolation of a central office are often beguiled into thinking that the distribution of complicated forms and their later return peppered with numbers indicates that a fairly precise effort reporting process has taken place. While this may be the case for reporting on effort attributed to sponsored research projects where random audits with severe default penalties are possible, the situation is very much different with respect to instructional effort. A close scrutiny of the data frequently reveals many inconsistencies. Follow-up visits to departments often lead to the discovery that all the faculty activity forms are filled in by the department clerk according to formula.

The optimistic note in all this is that each year a greater degree of responsibility and precision is reflected in the faculty effort data as it becomes more apparent to the academic community that the data has or could have some tangible effect on their environment and is not an empty exercise.

Joint Products (Common Costs)

In the academic environment it frequently happens that several services or products are provided simultaneously by the efforts of a faculty member. For example, a faculty member working with a graduate student on a research project can view his efforts as being both research and instruction. If his efforts are assigned a dollar value, any costing methodology requires that some algorithms be used to partition this cost into a research and an

instructional component--even when such distributions are artificial. Making this subjective separation obviously has a significant effect on the resulting costs of research versus instruction. Some institutions assign equal shares of cost to joint products; others prefer to use a differential assignment as determined by consensus, still others will assign the total cost to the activity which is considered to be the primary purpose of the project.

The subjective nature of this issue invalidates the NCHEMS costing procedure for major research institutions where joint products are more the rule than the exception. The NCHEMS study group was unable to reach an adequate solution to this problem.

Lack of Output Measures

In industry the outputs of an enterprise are well defined enough to be counted and assigned a numerical value. As a result, such highly beneficial techniques as cost/benefit analysis, optimization, and risk analysis can be successfully carried out. In education, however, the nature of the products are not even agreed upon much less quantified and assigned a value. This fact disarms the educational administrator of all the more useful management science methods, reduces his function from that of a manager to one of a monitor who must deal always in suspect proxies for the real, if invisible, outputs. Of all the reasonable activities in which an administrator can engage, cost analysis possibly carries the greatest potential risk of condemnation by the faculty. The reasons for this are many, often stated, and of some validity. Although no one will deny that the educational expenditures are real and correctly accounted for to the penny, the assignment of costs to particular activities is highly suspect and if

mishandled or misinterpreted, capable of creating much mischief. An administrator can expect considerable criticism and should prepare some reasoned defense against the more predictable attacks, the least of which would be the complaint that (s)he is one of those who "know the price of everything and the value of nothing."

One fact that an administrator should keep in mind is that any cost study in higher education is vulnerable to attack and the occurrence of a particularly telling critique should not necessarily be taken as an indication that his/her cost study is more in error than what is typical. Hample [8] cites some of the more commonly heard reactions to cost studies as follows:

(1) The costs for our program merely reflect what is, not what is appropriate. We need more support.

(2) Our costs are high because we are a quality department with nationally recognized scholars.

(3) Costs are always high for our discipline--a look at other cost studies will bear this out.

(4) Our department has no graduate program so we can't use cheap GA labor.

(5) Departments in agriculture and medical areas have AES and grant money within which to hide some costs.

(6) Lab and room size limit our ability to reduce costs.

(7) Our costs are high only because enrollments are down, but this is only a temporary cyclic phenomenon.

(8) Our most expensive courses are service courses to other programs.

(9) I can change the cost of a given course by a factor of 3 simply by assigning it to a higher or lower ranked faculty member.

Developing an Institutional Cost Model

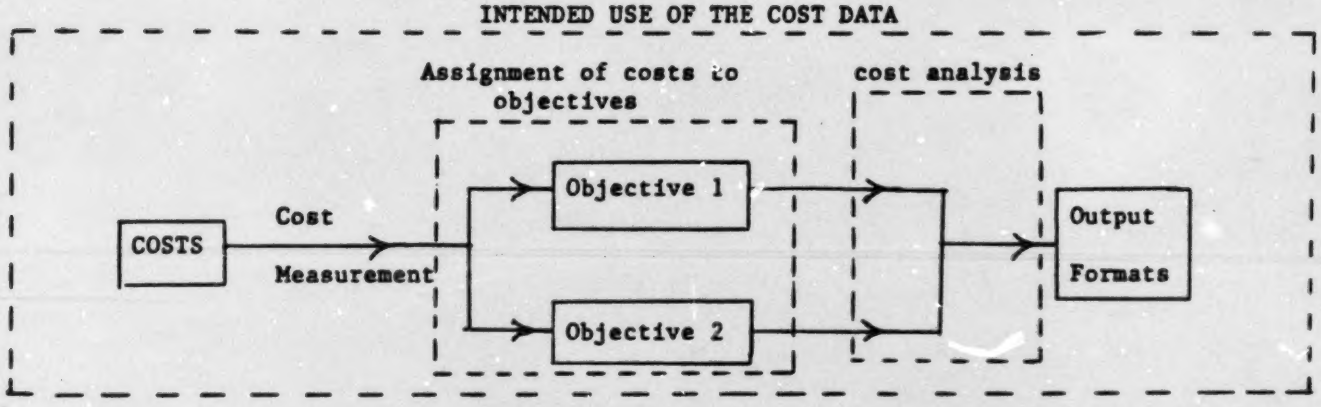
At the outset it may be useful to informally define what is meant by the terms "cost model," "costing methodology," and "cost analysis"--terms which are often used interchangeably to the confusion of the reader. A "cost model" is the entire process involved in producing cost data--in modern usage this would generally be a computer program that controls the processing of data. The "costing methodology" is the collection of decisions that have been made with regard to what data to use and how to manipulate it; these decisions are expressed mathematically as algorithms within the cost model. Finally, "cost analysis" is the label assigned to the process which takes the cost data produced by the model and makes it more useful to administrators by aggregating, comparing, interpreting and displaying it in a variety of ways. (This process could also be done by computer as a routine that uses the cost data as input.) Thus, a researcher charged with developing a costing model is faced with the task of developing the methodology from which will come the model; the researchers must also decide what type of analysis should be done and how the results should be displayed, for often the output formats are the most meaningful documents she/he can give to administrators in explanation of the proposed product.

Creating such a system is a tall order. Unless approached in an organized, rational fashion, the researcher may well become entangled in a mesh of confusing and conflicting detail. If he attempts to extricate himself by simply seizing upon a hastily conceived methodology (s)he runs the considerable risk of developing a model with incapacitating flaws that only become apparent much later. Because cost models tend to be complex, it is not advisable to think of them as existing entities, which is to say, one does not select a cost model from a preconceived assortment of ten models

much as one selects a car. Rather, it is necessary to consider a cost model as a system composed of several related components each of which must be developed by considering both the desired end product and the decisions made earlier with respect to related components. The intent of this section is to provide the framework for such a "systems approach" to the problem of selecting a cost model.

Figure 1 represents an attempt to display in pictorial fashion a procedure, derived from [1], for formulating a costing system.

Figure 1 A Costing System



In accordance with the idea of "conditional" costs, discussed earlier, the intended use of the cost data is the overriding criteria against which every decision made must be tested. Thus, the above configuration suggests that one should design a cost model by deciding what each of the identifiable components should consist of or should do. The following program would accomplish this by associating each of the components of the costing system with a corresponding step in the procedure:

(1) determine how the decision makers intend to use the cost data

(2) define the costs to be considered

(3) decide how to measure the costs

(4) determine the cost objectives

(5) decide how to assign costs to the cost objectives

(6) decide what analyses are to be performed upon the cost data

(7) determine the display formats

A team of researchers charged with recommending a specific cost model could accomplish this task by structuring their discussion so as to follow the schedule suggested above. To assist in this process, various options which are relevant to each component (step) have been gathered together and displayed in Tables 1 to 6. The subsequent discussions could then center on these options with the goal being to decide whether

(1) a given option supports the intended use of the cost data

(2) a given option can be implemented

(3) a given option is congruent with the options already selected.

The costing options appear in the form of six tables, one for each of the first six components of the costing system. The options listed within any section are intended to alert the researcher to the existence of the more common alternatives from which to choose and is not an all inclusive list. The researcher must either be familiar with the meaning and implications of each term or must consult a glossary, such as found in reference [9].

Once the formulation team has completed the seven step schedule, it will have a collection of options that have tentatively been deemed feasible building blocks from which to construct a cost model. In certain components of the system alternative options may be possible and thus the team members will have the latitude to assemble several reasonable cost models by using alternative options. The resulting cost models can then be proposed to the

key administrators as feasible candidates from which one model is to be selected for implementation.

In working through the seven step procedure an inexperienced team may benefit from a more formal procedure obtained by expanding the tables into a set of worksheets upon which the pro and con arguments for the use of each option can be written, together with the final recommendation of the team. The set of worksheets would then provide a detailed account of the selections made and the reasoning behind the choices. It is not possible to expedite the process by pre-printing on the worksheets the more obvious pro and con arguments, because the intended use of the cost data extends its influence even to the level of arguments related to the options; the pro and con arguments are very much dependent upon how the data is to be used.

If the participants are experienced and well acquainted with each other, the recommended seven step process could be quickly conducted by replacing the detailed worksheets with informal discussions of the feasible options.

The seventh and last step of the process, that of designing appropriate formats for the display of the cost analysis data, requires the most creativity, but even here there is help available to the formulation team as represented by the many examples illustrated in the literature. For example, references [4], [7], [11] provide an abundance of display formats.

Once all the options pertaining to the seven step process have been discussed and selections made, the groundwork has been laid for the actual construction of a computerized costing model. The remaining work is one involving a programmer and a member of the formulation team who acts as an interpreter in the sense of explaining the implications of each costing options with respect to the data to be used and the calculations to be

performed. It is at this point that the modelers must deal with such technical matters as the use of faculty activity analysis or an induced course load matrix--topics that are adequately discussed in many references typified by [9] and [11]. The only problem associated with such technical procedures is in understanding how they work; this is a problem of a different nature and one which is easier than the issue of this paper, which has been one of conceptualizing the entire costing model.

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Table I

Step I Intended Uses of the Cost Data

Option	Use
1.	Cost data will be used to make internal allocation of resources to colleges
2.	Program costs will be used within the long range planning process
3.	The mandate for developing cost data will be used as an impetus to effect needed modifications to current data systems
4.	Costing data will be given to deans and chairpersons for purposes of ensuring equity in allocating resources to programs within their units
5.	Cost data will be used to spot problem areas
6.	Cost data will be used as a check on decision making, to justify allocations made, and strengthen confidence in administrators
7.	Cost data will be provided to deans and chairpersons as a planning tool
8.	The cost data will serve as additional information to be considered when performing program reviews at the University level
9.	Cost data will be used as evidence to deny allegations of capricious retrenchment actions or to deal with general criticism of University management
10.	Cost data will be used for a periodic or continual monitoring of the relative efficiencies of instructional programs and/or departments
11.	Cost data will be used as a basis for programmatic budgeting (PPBS)
12.	Cost data will be used to make projections of future resource needs for budgeting purposes
13.	Cost data will be used to improve the University's managerial and accountability image
14.	Data on relative program costs will be used in determining differential tuition rates
15.	Cost data will be used to meet external reporting obligations or to support accreditation studies

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Table II

Step II Define the Costs to be Considered

Historical costs (expenditures) Projected costs Imputed costs Target costs (standard) Replacement costs	Marginal costs Controllable costs Unsupported costs (exp.-rev.) Costs by funding source (GF/ restricted/auxiliary) Fiscal or Academic Year costs General fund or all funds costs
Direct costs Indirect costs Full costs	Fixed costs Variable costs
Total costs Unit costs	

Table III

Step III Decide How to Measure Costs

Costs Related to:	Measure Options
Dept. instruction	Total dollars $/SCH/course $/SCH/course level $/major $/degree $/imputed degree = ($/SCH) x (SCH/degree) Faculty/FTE/course
Programs	$/SCH $/FYES major $/degree $/major
Dept. research, public service, administration academic support	Direct FTE assigned $

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Table IV

Step IV Determine the Cost Objectives

Costs Related To:	Objective Options
Instruction	Student credit hour Courses Dept. instruction subdivided into course levels Dept. instruction Program (from dept. perspective) Program (from major perspective) Type of delivery (i.e., lecture, lab, TV, etc.)
Research, public service administration, academic support	The total activity Activity partitioned into salaries, supplies, service, equipment

Table V

Step V Select Method of Assigning Costs to the Cost Objectives

Costs Related To:	Assignment Methodology Options
Department instruction	-Use Faculty Activity Survey to assign proportional part of faculty salaries to instruction -Assign all faculty salary costs to instruction according to credits or hours taught
Research, public service, administration, academic support	-Assign faculty salaries according to Faculty Activity Survey effort percentages. Assign remaining costs: -in the same proportions as the faculty salaries -to the activity in which they were expended
College and university overhead	-Methodology will depend upon the type of cost (e.g., library, plant maintenance, etc.) -Dean's contingency funds can be assigned according to transfers made

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Table VI

Step VI Decide What Analyses Are to be Performed

Analysis Options:
Composite analysis (costs partitioned over Instr., Research, Public Service and Administration)
Time Series (e.g., $/SCH over multi-year period)
Internal Comparison (by unit costs or Z scores)
External Comparison (using exchanged data or existing standards)
Controllable cost analysis
Cost/volume/revenue analysis

References

1. Adams, C. R., Hankins, R.L., Schroeder, R.G., & Kingston, G.W. A study of cost analysis in higher education (4 vols.). Washington, D.C.: American Council on Education, 1978. (Vol. 1: The literature of cost and cost analysis in higher education, Adams, Hankins, & Schroeder; Vol. 2: The production and use of cost analysis in higher education, Adams, Hankins, & Kingston; Vol. 3: Site visit descriptions of costing systems and their use in higher education, Schroeder, Ed.; Vol. 4: The future use of cost analysis in higher education, Adams, Kingston, & Schroder.)

2. Allen, R.H., Topping, J.R. Cost Information & Formula Funding: New Approaches, NCHEMS, 1979

3. Bowen, Howard R., The Costs of Higher Education: How Much Do Colleges and Universities Spend per Student and How Much Should They Spend? JosseyBass, San Francisco, 1980

4. Budig, Jeanne E., "A Cost/Productivity Profile of Academic Program Costs at a Small Traditionally Black State Land Grant University," Resources in Higher Education. (ED 189946), 1980

5. California Post-secondary Education Commission, "Determining the Cost of Instruction in California Public Higher Education: A Feasibility Study of Alternative Methods." Resources in Education ED 200173

6. "California and Western Conference Cost and Statistical Study," University of California Press, 1955

7. Collard, William, Huff, Robert, "Exploring Cost Exchange at Colleges and Universities," NCHEMS, 1974

8. Hample, Stephen R., "Cost Studies in Higher Education," The AIR Professional File, No. 7, Fall 1980

9. National Center for Higher Education Management Systems (NCHEMS). Procedures for determining historical full costs. (Technical Report No. 65, 2nd ed.). Boulder, CO: Author, 1977.

10. Stuart, Douglas A. "The Application of Formula and Cost Analysis Procedures to the Budgeting of Academic Departments," Ph.D. Thesis, Michigan State University, 1966

11. Swanson, John E., Arden, Wesley, and Still, Homer E., Financial Analysis of Current Operations of Colleges and Universities, Inst. of Public Administration, University of Michigan, 1966

12. Topping, Jim, "Evaluation of the IEP Costing Procedures: A Pilot Study Project by Six Major Research Universities," Boulder, CO: NCHEMS, 1979

13. Topping, Jim, "Exchange Procedures for Major Research Universities: Technical Diary of the Major Universities," Pilot Test, NCHEMS, 1979, (ED 176634)

14. Young, Michael E., "Cost Analysis and Overhead Charges at a Major Research University," Resources in Higher Education (ED 220035), 1982

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